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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/710,628	11/08/2000	Sien G. Kang	18419-008210US	5772

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EXAMINER

RAO, SHRINIVAS H

ART UNIT PAPER NUMBER

2814

DATE MAILED: 02/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/710,628

Applicant(s)

KANG ET AL.

Examiner

Steven H. Rao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 December 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment

Applicants' amendment filed on November 24, 2003 has been entered.

Therefore claims 1, 19, 21 and 22 as amended by the amendment and claims 2 to 18 and 20 as previously recited are currently pending in the Application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 5-6, 7-19 and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (U.S. Patent No. 5,869,387, herein after Sato; previously applied) for response to Applicants' arguments see section below.

With respect to claim 1, Sato describes a method of fabricating substrates including the steps of : providing a substrate comprising a film of material characterized by a non uniform surface with plurality of defects (Sato fig. 1 A # 102, col. 7 lines 65), at least some of the roughness being 100 Angstroms or greater (Sato col. 1 line 65), and applying a combination of a deposition species for deposition of a deposition material and an etching species for etching an etchable material during a portion of time that the non-uniform surface is subjected to the etching an etching species contacting the non-uniform surface in a thermal setting to reduce a level of non-uniformity of the non-uniform surface by filling a portion of the defects to smooth the film of material, the film of material being substantially free from defects and being characterized by a surface

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roughness of a predetermined value. (Sato col. 9 lines 5-55, col.10 line 59 to col. 11 line 5 and col. 7 line 64 to col. 8 line 21, col. 4 lines 48-60, col. 9 lines 57 to col. 10 lines 12).

The performance of two steps simultaneously, (i.e. applying a deposition species and an etching species) which have previously been performed in sequence (separately applying deposition species and etching species) was held to have been obvious. In re Tantincloux, 108 USPQ 125 (CCPA 1955), further, " As a matter of fact selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results. In re Burhaus, 154 F.2d 690, 69 USPQ 330 (CCPA 1946), In re Gibson 39 F.2d 975, 5 USPQ 230 (CCPA 1930)..

With respect to claim 2, wherein the substrate is heated to 1000 ° or greater (Sato col. 2 line 47- 1260 degrees or greater).

With respect to claims 5 and 6, wherein the particles are hydrogen bearing species derived from hydrogen gas during an implantation process. (Sato example 2 col. 18 lines 20-35).

With respect to claims 7-9, wherein the surface roughness predetermined value is between 2- 0.1 nanometers root mean square. (Sato claim 11, etc.).

With respect to claims 10-11, wherein the etching species, includes a hydrogen, halogen bearing compounds like Chlorine, HCl, HBr, HI and HF. (Sato Embodiment 2, col. 8 lines 56-col. 11 line 39).

With respect to claims 12-13, wherein the etching process comprises a fluorine bearing compound like SF₆, CF₄, NF₃ and CCl₂F₂. (Sato col.9 lines 15-25).

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With respect to claims 14-16 wherein the deposition species comprises a silane bearing gas, silicon bearing species like SiH_4 , SiXCIXH_2 and SiCIX . (Sato Example 8 col. 20 lines 1-2).

With respect to claim 17, wherein the non uniform surface is cleaved by Smart Cut or an ELTRAN process (Sato col. 4 line 62).

With respect to claim 18, wherein the defects are called HIF defects.

It is noted for the records that while an applicant may his/her own lexicographer, patentability of claims is determined by whether similar structures/methods are described by the prior art and not what they the structure/method are called.

As stated above, Sato describes similar defects for same purpose therefore irrespective of applicants' nomenclature, the prior art discloses similar defects therefore the defects are obvious in view of Sato.

With respect to claim 19, wherein the substrate is a silicon substrate having a single crystal orientation. (Sato col. 9 line 57, and page 2 citing Journal of Applied Physics 1 June 1990).

With respect to claim 20, wherein the method of fabricating the substrate includes the steps of : providing a substrate comprising a film of material with a non-uniform surface, the non-uniform surface including a plurality of defects, at least some of the defects being 100 Angstroms or greater (Sato fig. 1A # 102, col. 7 lines 65 and col. 2 lines 9-11) and applying simultaneously to the non-uniform surface a combination of a silicon-containing deposition species for deposition of a deposition material in order

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to smooth the surface (Sato col.9 lines 5-55, col. 10 lines 59 to col. 11 line 5 and col.7 line 64 to col. 8 line 21) it is noted current case is :

The performance of two steps simultaneously, which have previously been performed in sequence was held to have been obvious. In re Tantincloux, 108 USPQ 125 (CCPA 1955), further, " As a matter of fact selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results. In re Burhaus, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

With respect to claim 21, wherein the combination of the deposition species and etching species are contacting the non-uniform surface in a thermal setting of a temperature of about 1,000 degrees Celcius or greater Sato col. 2 lines 47, claim 23, etc.).

With respect to claim 22, wherein the fabricating method includes the steps of : providing a silicon substrate comprising a film of material with a non-uniform surface, the non-uniform surface including a plurality of defects, at least some of the defects being 100 Angstroms or greater (Sato fig. 1A # 102, col. 7 lines 65 and col. 2lines 9-11), the silicon substrate having a single crystal orientation, the non-uniform surface including particles derived from hydrogen gas during an implantation process (Sato col. 9 lines 5-55 and page 2 citing Journal of Applied Physics 1 June 1990 and claim 1 etc.) and applying simultaneously to the non-uniform surface a combination of a silicon-containing deposition species for deposition of a deposition material and a Halogen – containing-etching species for etching an etch able material in order to smooth and reduce a level of non-uniformity of the non-uniform surface, the halogen –containing

etching species including HCl (Sato col.9 lines 5-55, col. 10 lines 59 to col. 11 line 5 and col.7 line 64 to col. 8 line 21 and rejection under claim 20 for simultaneously applying silicon deposition species and halogen containing etching species).

A. Claims 3-4, are rejected under 35 U.S.C. 103(a) as being unpatentable over Sat et al. (U.S. Patent No. 5,869,387, herein after Sato) previously applied and Wolf , Silicon processing for the VLSI Era , Vol. 1 , pages 57-58.

With respect to claims 3 and 4, wherein the temperature increase is 10 or 20 degrees per second or greater.

Sato does not specifically describe the temperature increase is 10 or 20 degrees per second or greater.

However Wolf vol. 1 pages 57-58 describes the temperature increase is 10 or 20 degrees per second or greater to evenly heat the substrate and avoid causing slip or war page.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Wolf's teaching of the temperature increase is 10 or 20 degrees per second or greater in Sato's method to evenly heat the substrate and avoid causing slip or war page. (Wolf Vol. I pages 57-58).

Response to Arguments

Applicant's arguments filed on 02/18/2003 have been fully considered but they are not persuasive for the following reasons :

Applicants' first contention is that Sato fails to show or suggest, " applying a combination of a deposition species for deposition of a deposition material and an etching species for etching an etchable material during a time that the non-uniform surface is subjected to etching in the manner claimed " (sato col. 9 lines 5-55, col. 10 lines 59 to col. 11 line 5 and col. 7 line 64 to col. 8line 21, as also stated under rejection of claim 20) and the combined species " contacts the non-uniform surface in a thermal setting to reduce a level of non-uniformity of the non-uniform surface by filling a portion of the defects to smooth the film of material " (also stated in the previous response) is not persuasive because Sato in col. 10 lines 6-12 states :

In the present invention, after the thin monocrystal layer is formed on the porous layer, the substrate having the thin monocrystal layer formed thereon is heat-treated in a reducing atmosphere to flatten the surface of the thin monocrystalline Si layer as shown in FIG. 2B and FIG. 4B. The conditions of the heat treatment are the same as in Embodiment 1.

Further col. 6 lines 30-31 :

thereon in a reducing atmosphere to flatten and smooth the surface of the monocrystal.

col. 7 lines 20-22 :

practiced in addition to other processes. According to this invention, the roughness in a local monocrystal region on a surface of a substrate which cannot otherwise be flattened by polishing, can be flattened.

Therefore Applicants' contention is not persuasive.

Further as seen above Sato employs deposition process to smooth a non-uniform layer.

Applicants' next contention that Sato does not teach either the deposition or etching steps reduce the level of non-uniformity of a non-uniform surface is not persuasive for reasons stated above.

Applicants' content that dependent claims 2, 5-6 and 7-19 are allowable because they depend upon allegedly allowable claim 1.

However as seen above claim 1 is not allowable and therefore claims 2, 5-6 and 7-19 are also not allowable.

Claims 20-22 were alleged to be allowable because the Examiner has allegedly "used hindsight arguments to indicated the obviousness" because Sato does not show or suggest the method recited in claim 20 is not persuasive because as shown in the rejection above all the presently recited steps are taught by Sato and no hindsight has been used.

Applicants' next contention that their claimed method produces the unexpected result namely the claimed etchable material becomes smooth in the manner claimed is not persuasive because as shown above Sato at least in col. 10 lines 6 to 12, col. 6 lines 30-31 and col. 7 lines 20-22 describe the alleged unexpected result i.e. etchable material becomes smooth in the manner claimed.

Applicants' attempt to limit the teachings of Sato to heat treatment using a hydrogen rather than an etching species and a deposition species in the manner

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claimed is also not persuasive because Applicants' above argument fails to consider the use of HF etchant described in Sato's various examples e.g. 31-33 , etc.

However as seen above those arguments were not persuasive and therefore claims 20-22 are also not allowable.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Steven H. Rao whose telephone number is (703) 3065945. The examiner can normally be reached on Monday- Friday from approximately 7:00 a.m. to 4:30 p.m.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. The Group facsimile number is (703) 308-7722.

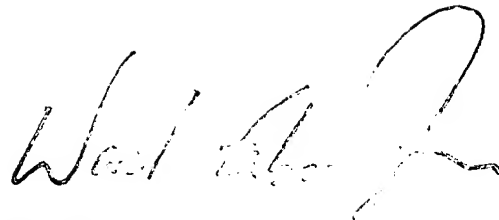
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Steven H. Rao

Patent Examiner

February 18, 2004.



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